

Prototype Specification for VVVF Automatic Sabbath Elevator
(Modified January 2017)

This prototype specification specifies general requirements for Sabbath and holiday operation of a VVVF elevator. As VVVF elevators may differ greatly from one another in the details of their drive systems and control, this specification is not necessarily completely applicable to a specific elevator. Only when all details of operation are made known to the Institute for Science and Halakha can a definitive specification be written for a particular elevator.

1. Automatic service.

a. When operating on the Sabbath or holiday in the Sabbath mode, the elevator shall operate completely automatically according to a preset program without the possibility of affecting the program by operating the pushbuttons in the car or at the stations. The car shall stop at the entrance floor and each desired station, remain there a preset time interval, and then proceed to the next station in accordance with the preset program without being influenced by any external factor.

There are two modes of Sabbath service. Either mode may be chosen. It is not required that the elevator be able to operate in both modes. In Mode A, the elevator changes over completely to continuous Sabbath mode during the hours of its operation. In such service, the car does not respond to call or dispatch buttons and, therefore, non-observers cannot be accommodated except by the automatic program. In Mode B, to satisfy both Sabbath observers and non-observers, the Sabbath mode consists of a single Sabbath trip at predetermined fixed intervals. The elevator remains in normal weekday service between these trips. The Sabbath trip consists of travel directly to the entrance floor and from there to all floors receiving Sabbath service. The car then returns to the entrance floor and, after a parking interval to allow exit of passengers, returns to normal service until the next Sabbath trip.

In both modes of Sabbath service, the car may stop at desired intermediate stations during ascent or descent or in both directions of travel. The times at each floor need not be equal. It may be desirable that the car park a longer time at the entrance floor. This allows more time for entrance and exit of passengers and also lowers the motor duty cycle.

The requirement for automatic service does not cancel or take precedence over existing safety requirements for alarm buttons, door open buttons and door safety buffer which shall remain operative as described below.

b. Mode-A Service.

1. A time switch operated by a clock mechanism shall be provided to allow setting of the hours during which operation in the Sabbath mode is desired. The clock may have a 24-hour or seven-day cycle. Where appropriate, the clock may be replaced by computer software that takes into account the different hours of the onset and end of the Jewish Sabbath and holidays at different seasons of the year and the occurrence of Jewish holidays at different Gregorian dates each year.

2. If a 24-hour clock is used, a manual switch shall be provided to enable changing from normal to Sabbath mode (key operated, if desired). The switch is turned on before the onset of the Sabbath or holiday and turned off after it has ended. Setting the clock switching times and operation of the changeover switch shall be the only operations required to put the elevator into Sabbath mode. Where a seven-day clock is used, the manual switch is not required.

Because the time settings of the seven-day clock must be changed both before and after the occurrence of holidays that occur on weekdays, an operation which may sometimes be complicated for untrained personnel, it has often been found preferable to use a 24-hour clock with the manual switch operated before and after each holiday in the same manner as before and after the Sabbath.

3. If the clock switch connects the Sabbath mode when the car has previous calls registered, the car shall accept no further calls and execute all existing calls before going over to the Sabbath mode.

4. If Sabbath mode service is ended when the car is in motion or at an intermediate station, the car shall proceed to the entrance floor and open doors before ending the service.

5. It is preferred that the car be completely out of service on the Sabbath during those hours when the Sabbath mode is not connected. If it is required that the car revert to normal service during the hours when the Sabbath mode is not connected, there shall be clear indication during Sabbath service that the car is operating in the Sabbath mode as detailed below in paragraph 2d.

c. Mode-B Service.

In mode-B service, single Sabbath trips are made at appropriate intervals. The elevator returns to weekday service between Sabbath trips. The intervals at which a Sabbath trip is to be made shall be pre-programmed to meet passenger needs. It is usual to have shorter intervals between trips during hours of high Sabbath-observer traffic and longer intervals during hours when traffic is not expected.

As the intervals between trips are pre-programmed for the entire Sabbath, a 24-hour clock is not used with mode-B service. Either a seven-day clock or a manual switch shall connect the Sabbath trips to the normal service. If a manual switch is used, it shall be connected before the onset of the Jewish Sabbath and disconnected after it ends.

Because the time settings of the seven-day clock must be changed both before and after the occurrence of Jewish holidays that occur on weekdays, an operation which may sometimes be complicated for untrained personnel, it has often been found preferable to use a manual switch operated before and after each holiday in the same manner as before and after the Sabbath.

2. Lights and Indicating Lamps.

a. The lighting in the elevator car shall remain on continuously during operation in the Sabbath mode.

b. If the car is out of service at some time during the Sabbath (Mode A), it shall be parked at the entrance station with the lights out and the doors open. In elevators equipped with manually operated hinged doors, opening the door shall not cause the lights to turn on.

c. No indicating lamps shall be activated or extinguished during service in the Sabbath mode. There shall be no flashing, intermittent operation or visible changes in light intensity in any lamps that are illuminated continuously during service in the Sabbath mode. This requirement applies to lamps in the car, at the stations and in the control room with the exception of LED-type lamps that are an integral part of the electronic control panel and located in a closed cabinet and locked room.

When LED light sources form a number, letter, or symbol, they shall be disconnected or shall show a constant unchanging symbol in Sabbath mode. This limitation applies also to floor numbers displayed in the control panel but does not apply to symbols that appear in the control panel to indicate operational status to technicians.

d. If the car reverts to normal service during the Sabbath, there shall be visible indication at each station when Sabbath service is in operation subject to the requirement above that all indicating lamps remain illuminated continuously during this service. It is desirable that there be indication in the car as well, located so as to be easily seen by incoming passengers. If the elevator is out of service when not in Sabbath mode (Mode A), such indication at the stations and in the car is desirable but not mandatory. In Mode-B service, these visible indications shall be turn on at the beginning of the Sabbath trip and extinguished when the car arrives at the entrance floor at the end of the trip.

e. If the car reverts to normal service during the Sabbath, a sign shall be posted at the entrance floor and other appropriate places warning Jewish passengers against entrance into the elevator when it is not in Sabbath mode. The possibility that a passenger who desires Sabbath service enters the car on the Sabbath while it is in normal service must be avoided or made most improbable.

3. Car Direction and Position Indicators.

a. Car position indicators shall not operate during Sabbath service from when the car begins its descent until it starts ascent. For reasons of simplicity, it is recommended that they be disconnected completely. To enable floor identification, it is recommended that there be clear indication of the floor number at the landings so positioned as to be visible to the car passengers as the doors open.

If, for satisfactory service, the position indicators are operative during ascent, they shall be disconnected, or the indication changed to a fixed unchanging symbol, when the car arrives at the highest floor served and shall return to operation at the end of the parking time before ascent from the lowest floor.

b. If the elevator stops only at a few stations or if it stops at stations only when travelling in one direction and travels non-stop between end floors in the other direction, the direction indicating arrows shall be disconnected during Sabbath service.

c. If the absence of travel-direction indication will seriously interfere with proper passenger service, the indicators shall operate as described below.

All UP arrows shall be turned on at the initiation of door closure before the car leaves the bottom floor and shall remain on as the car ascends. All UP arrows shall be extinguished and all DOWN arrows shall be turned on at any time between arrival at the top floor and the initiation of door closure before descent. The DOWN arrows shall remain lighted during descent and shall be extinguished at the moment the UP arrows are activated at the end of the parking time at the bottom floor. The limitations of Paragraph 2, above, do not apply to directional arrows operated as herein specified.

d. Directional arrows used as in subparagraph c, above, shall be of the LED, LCD or EL types. If it is desired to use other lamp types, send technical details to the Institute with a request for instructions.

4. Pushbuttons.

a. In Mode-A service, all call pushbuttons at the stations and dispatch buttons in the car shall be disconnected from voltage when the car is in the Sabbath mode. This requirement does not apply to call buttons common to a multiplexed group of elevators where some elevators of the group are operating in Sabbath service and others in normal weekday service.

In Mode-B service, the call and dispatch buttons may remain operative only if necessary to provide satisfactory service to all. To avoid the possibility that stops at floors not included in the Sabbath program might confuse a passenger and cause exit at an incorrect floor, it is preferred that the car not accept external calls during the Sabbath trip. If call or dispatch buttons remain operative, there shall be clearly visible indication of the floor number posted at all floors on the doorframe or on the wall opposite the doors. (On descent, normal floor indication does not operate in Sabbath mode.)

b. The Alarm button shall operate in Sabbath mode as in normal weekday service.

c. The Door Open pushbutton shall operate as described below in paragraph 6d.

d. If local codes require a STOP button, inform the Institute of the requirements and request further data.

5. Switches.

a. Switches actuated by car descent in its normal travel, such as those used for slowdown, stopping, floor identification, door opening range or preopening, shall be of vane-operated photoelectric or electronic proximity detector types that have been approved by the Institute for

Science and Halacha. Magnetic and electromechanical switches, shall not be actuated operatively on descent except as described below.

It is permitted to perform switching operations by the Schmersal USP system

All photoelectric switches in which an opaque vane or partition interrupts a light beam to perform the desired operation are acceptable. Switches in which the vane reflects light back to the photodetector and, thereby, the appearance of light at the detector performs the operation are not acceptable.

Electronic proximity switches, often called inductive proximity sensors, are switches that change state when the proximity of metal absorbs energy from the feedback loop of an electronic oscillator and thus lowers the amplitude or stops the oscillation completely. Such sensors manufactured by Turck, Balluff, Scan, Pepperl+Fuchs, Sick, and Telemecanique have been approved to date. Approval may be granted to other manufacturers after technical details of their sensors are made available to the Institute.

b. The approved switches may replace the usual switches completely and be used both in normal and Sabbath mode. Alternatively, the regular switches may be disconnected and the approved switches replace them only when the car is in the Sabbath mode.

c. Where building safety codes require an electromechanical switch to be actuated during descent but this specification does not permit it to perform its function, the Institute must receive circuit diagrams showing the circuits of such switches. In many cases, electromechanical switches used to verify that the car has slowed down before reaching the lowest landing may remain in normal use after minor circuit modification. After examination of the circuit diagram, the Institute will supply instructions concerning such electromechanical switches.

In cases where the Institute cannot permit the code-required electromechanical switch, an approved switch that shall perform the required operation shall precede the electromechanical switch. The electromechanical switch remains connected as a backup to perform the operation in the event of malfunction of the approved switch. For example, if the mechanical switch performs a disconnect, the contacts of the approved switch are placed in series with those of the mechanical switch and its operating vane adjusted to actuate the approved switch when the car is a short distance above the actuation point of the mechanical one. It is preferred that the contacts of the approved switch be located on the voltage side of the supply and the mechanical switch nearer to the common ground side. Means shall be provided to enable verification, visually or by electrical measurement, that the permitted switch is the actual operative one and precedes the backup.

d. The specified limitations on switch types apply only where the actuation and resultant actions occur on car descent. There is no limitation on switches actuated operatively only during ascent. Switches not normally actuated in Sabbath service need not be modified or replaced. Thus, switches actuated only in the event that the car descends below the bottom floor or below the lowest floor served in Sabbath service may remain unchanged.

e. If preopening and releveling uses switches not permitted in the Sabbath mode, it is recommended that there be no preopening or releveling in Sabbath mode. If releveling is required, see Paragraph 10, below.

6. Doors.

a. A warning buzzer shall be installed which, in Sabbath service, shall buzz for approximately two to three seconds before the doors start to close at the end of the predetermined parking time at the landing. The buzzer serves as a warning to the passengers that the doors are about to close. The buzzer should be sufficiently loud to be heard in the car and just outside the open doors. It should not be that loud or harsh sounding that it disturbs persons in rooms adjacent to the elevator. A recorded voice message or a bell may be used instead of a buzzer. The voice message or bell sound shall be repeated at short intervals until the doors begin to close or until the end of time that the specification requires the buzzer to operate.

b. If there is interference with door closure because of contact with a safety buffer, the door shall stop. It may stay in that position or reopen either partly or completely. After stopping or after reopening, the door shall not attempt reclosure for a preset time of at least five seconds. Before reclosure, the buzzer shall sound repeating the cycle described in subparagraph a, above. Interference with reclosure shall cause repetition of the above-described delay and warning buzz cycle. In no circumstance, shall release of the door cause immediate continuation of the closing process. Nudging is not permitted.

c. If the door is equipped with a photoelectric safety device in addition to a safety buffer, the photoelectric device shall be made inoperable in the Sabbath mode. (Exception in subparagraph e, below.) The photodetectors themselves must be inactive, i.e. they shall not react to the presence or absence of light (e.g., by disconnect of supply voltage). The door safety buffer shall remain operative.

d. The Door Open pushbutton shall operate in the same manner as the safety buffer switch, i.e., after opening the door, it shall initiate the delay and warning-buzz cycle and subsequent attempt at reclosure described in subparagraph a, above.

e. If the photoelectric safety device is the only door protection with which the elevator is equipped or if its disconnection will cause hardship, as in the case of elevators used often by passengers who are aged or have disabilities, the photoelectric device shall be operated as specified below.

The photoelectric device shall be disconnected from supply voltage immediately upon arrival of the car at the landing before doors are opened. The device shall be reconnected at the moment that the doors begin to close at the end of the buzz.

If upon reconnection, the photoelectric device detects interference as the doors are closing, the doors shall stop and may reopen partially or completely. A delay of at least five seconds shall be then initiated before reclosure is attempted. The warning shall sound before reclosure. Should there be interference with the reclosure, the doors shall reopen again followed by another delay and warning buzz. If interference is detected before the doors start to close, a delay of at least

five seconds shall be initiated followed by a warning buzz. If the interference remains at the end of the buzz, the delay and buzz cycle shall be repeated.

f. The parking time at the landings shall be sufficiently long to allow, under average conditions, entry and exit of the passengers before the warning buzzer sounds.

g. If the elevator is equipped with a manually operated shaft or car doors, all voltage shall be disconnected from door operated switches from the moment the car stops at a station until the end of the buzz before starting travel to the next station. If a door is open at the end of the buzz, the car shall remain at the station for an additional interval of at least five seconds. At the end of the interval, the warning buzzer shall sound again to warn passengers to close the manual doors. The interval - buzz cycle shall be repeated until the door is found to be closed at the end of a cycle.

h. In elevators with manually operated hall door and automatic car door, if the hall door is found to be closed after two seconds of buzz, the car doors shall begin to close. The buzz before travel shall continue until the shaft door is locked. If the shaft door locks at the onset of car door closure, the buzz may end immediately. If the shaft door locks only upon complete closure of the car door, the buzz shall continue until locking of the shaft door.

i. If the elevator changes over to weekday service when the Sabbath mode ends, the visual indication of Sabbath mode shall be extinguished immediately but the photoelectric door protection shall remain disconnected for at least 20 seconds after the doors open to allow exit of passengers. In the case of hinged doors, voltage to the door safety chain shall remain disconnected for the same time period.

7. Weighing Mechanisms.

a. All microswitches activated by weight on the car floor shall be disconnected when the elevator is in Sabbath mode.

b. If operation without overload indication is not feasible, inform the Institute of all details. The Institute may then supply an alternative solution that modifies the mechanism to enable its use on the Sabbath.

c. If the elevator uses a continuous weighing system such as differential-transformers, strain gauges, or potentiometers, the weighing system shall not be used in its present form. It shall be replaced by a modified system that uses the weight detection elements in a manner that meets the requirements of the Institute for Science and Halakha. To receive appropriate information, all details of the system must be supplied to the Institute. In many elevators, it has been found that the elevator stops accurately at floor level at all loads when the weighing system signal is replaced on the Sabbath by a fixed-voltage signal simulating a 40 to 50 percent fixed load.

8. Dynamic Braking.

a. If power is fed to the elevator through circuit elements that makes it impossible to feed power back to the mains, the braking system usually uses resistors and capacitor to store or dissipate energy during braking.

Where resistors are used to dissipate energy during speed limitation or braking, the resistors shall not reach a temperature that results in visible radiation from the resistive element itself. If bare resistance wire is used, this is determined by viewing the resistor wire in complete darkness during descent after repeated descents at full load and at ambient temperature not less than 20 degrees Celsius. If the element is coated only with a thin layer of paint, the paint shall be scraped off at a number of points along the resistor to verify that the wire does not emit a reddish glow at any time during speed limitation or braking.

If the resistor wire is coated or enclosed and temperature measurement is not feasible, calculation shall show that the wire itself is below 400 degrees Celsius when the current through it is that generated at the onset of braking on descent with full load.

Alternatively to the above if the wire is above 400 Celsius, and to enable use of standard parts, four such banks connected in two parallel legs, each leg consisting of two banks in series, shall replace the usual bank of resistors. This series-parallel connection results in the same total resistance but four times the cooling surface. The additional resistor banks may be mounted on the roof of the control cabinet or other appropriate place.

b. If speed limitation or braking is accomplished by return of energy to the power mains, the maximum instantaneous power returned to the mains during braking on descent at full load shall be measured. A dummy load that dissipates this power shall be connected to the mains at the onset of braking on descent and disconnected when there is no power being fed back to the mains or when car movement stops. It is permitted, but not recommended, that the dummy load be connected constantly during descent. If, at high loads, car speed is limited during descent by dynamic braking, this dummy load, or a smaller dummy load capable of dissipating the maximum value of the speed- limiting energy feedback, shall be connected to the mains during descent. The load shall be connected before the end of acceleration. Such dummy loads shall meet the requirements of sub-paragraph a, above (maximum temperature limitation, no visible reddish glow on the resistance wire in complete darkness).

Because of the Sabbath limitations, it is usually preferable to avoid the return of energy to the power lines and the modifications it requires.

9. Speed and Position Detection.

Optical encoders or tachometers used in the elevator to determine car position and speed shall be replaced by encoders modified by the Institute to meet its requirements. In the case of incremental encoders, it has usually been possible to modify the encoder normally supplied with the elevator thereby avoiding the need for changes in the mechanical mounting. There might be difficulty in modifying incremental encoders with 5000 to 10,000 ppr as often used in gearless installations

It is not been possible to modify absolute encoders to meet the Sabbath requirements and they cannot be used. In an elevator designed to use an absolute encoder, it is recommended that the encoder be replaced by a system using only incremental encoder as described in paragraph 10 below or by the USP system manufactured by Schmersal GmbH. The USP is a shaft-switch and absolute-encoder replacement that supplies all the data required by the elevator control and can be used without need for modification for Sabbath use.

10. Synchronous Motor

Many new elevators use permanent magnet synchronous motors instead of the traditional asynchronous induction motors. Their operation and the various methods used to determine the position of the motor shaft (encoder, Hall detector, input-current analysis) have presented questions as to their suitability for Sabbath use and many companies have not been willing to modify their systems to meet requirements. To be approvable the system must use the A, B, and Z rectangular outputs of an incremental encoder that has been modified and/or approved by the Institute. At connection of power to the elevator the elevator moves slowly over the entire shaft in a learning trip. When reaching the Z pulse it begins to count the A and B pulses to learn the points of slowdown, stopping, door opening, etc. If power is disconnected, the learning trip is repeated upon reconnection of power. At this time only one elevator company uses a system that is approved.

11. Releveling.

If the car arrives inaccurately at the landing, releveling is permitted before the doors are opened. It is preferred that there be no releveling once the doors start to open or while they remain open. If it is necessary that there be such releveling, the Institute must be informed of the details of the operation of the releveling circuitry to determine if modification is required.

12. Approval.

a. Final approval of the elevator for Sabbath use will be give by the Institute for Science and Halakha when it has been verified that the elevator meets all of the requirements.

b. To determine whether or not their use is permitted on the Sabbath, the Institute shall be supplied with information about any device (system, equipment, apparatus) that includes electrical or electronic components and is not mentioned in this specification. Such equipment can be used only if approved by the Institute